

## ABSTRACT

A frequency synthesizer suitable for integration in a low voltage digital CMOS process controls a VCO using a dual loop structure including an analog loop and a digital loop. The digital loop includes an all digital frequency detector, which controls the center frequency of the VCO. The analog loop includes an analog phase detector and charge pump, which add phase coherence to the frequency controlled loop, thus eliminating any static frequency error. In effect, the analog loop reduces the noise of the digital logic and VCO, and the digital control provides frequency holdover and very low bandwidth. The bandwidth of the digital loop is made much smaller than the bandwidth of analog loop, and is preferably 200 times smaller. This gross parametric difference is used in the design of the VCO to allow two separate control inputs, one from the analog loop and one from the digital loop, with both inputs functioning relatively independently of each other.